CONTRIBUTIONS

TO

ORTHOPŒDIC SURGERY.

BY

CHARLES F. STILLMAN, M. D.,

OF NEW YORK,

DELEGATE FROM AMERICAN MEDICAL ASSOCIATION TO FOREIGN SOCIETIES FOR 1881-82; PERMANENT MEMBER AMERICAN MEDICAL ASSOCIATION; MEMBER NEW YORK COUNTY MEDICAL SOCIETY, ETC.

AN AID

TO THE

MECHANICAL TREATMENT OF WEAK ANKLES

AND

INVERTED FEET.

Reprinted from "The Medical Record," Sept. 17, 1881.

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MECHANICAL TREATMENT OF WEAK ANKLES AND INVERTED FEET.

BY CHARLES F. STILLMAN, M.D.

Although weak ankles and inverted feet comprise a class of cases constantly coming under the care of the general practitioner, they have hitherto received but little attention, owing mainly to the insufficiency of the mechanical contrivances provided for their treatment. If we examine the ligamentous structure of the ankle-joint, we observe that externally the ligaments are placed so as to allow more mobility than internally—nature evidently relying upon the inherent contractile power of the peronei muscles to hold the foot at its natural angles with the leg, and to perform all necessary eversion. The weakness or insufficiency of these muscles is of itself a sufficient cause of the deformity we are considering, even though the supports of the joint be otherwise normal; but these may also be unduly relaxed.

A tendency to turn the ankle under, to have it give way externally, to point the toes inward and downward, and an habitual stumbling, shuffling gait are the main symptoms displayed, and as every parent wishes a child to grow up with correct and graceful movements in walking, the occurrence of these defects, either singly or together, causes professional advice to be sought. There exists a feeling in the minds of the laity that it is almost useless to do so, so often has the remark been made to them by the surgeon consulted,

"Let the feet alone; they will come out all right in time, as the muscle gets strong." But while the muscle is becoming restored under the influence of improved general health or local tonics, massage, etc., the deformity increases because the weight of the body must be carried by these insufficient supports, and every effort at walking upon a malplaced foot makes the deformity greater.

The physician is then driven to seek the aid of an instrument-maker to obtain a brace which will support the limb securely while the muscle is improving. The instruments which could hitherto be procured for this purpose afforded support, but allowed only a vertical motion in the ankle-joint. This feature was shared by all and is incorrect, since the normal degree of lateral movement should be permitted. If the reader will cross one thigh upon the other firmly, so as to allow no play whatever to any of the muscles above the knee, he will see that he can evert the foot in a horizontal plane about 45° by the action of the muscles *below* the knee, and if the external muscles of the leg be relaxed (not otherwise), he can invert the foot to the same degree, but its outer edge turns under.

I wish here to assert that a certain amount of lateral movement of the foot is absolutely necessary to the performance of its normal functions, and since the peronei muscles are the chief agents in the exercise of this lateral movement, any treatment directed toward the increase of power in these muscles must provide for this lateral movement.

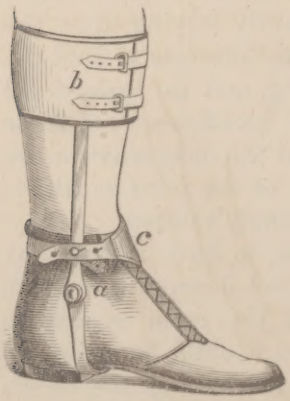

Fig. 1.

To allow this lateral movement to its fullest extent and yet keep the ankle supported, is the problem which has for a long time engaged the attention of surgical mechanicians.

The brace most commonly used is that represented in Fig. 1; but while this affords the ankle support on both sides, it allows no lateral movement whatever, and is therefore not satisfactory, for—with this brace—if eversion be allowed at all, it is by the

outward *rotation* of the entire limb on the pelvis, *and not a local eversion at the ankle.*

Now unless a deficiency of muscular power exists in the muscles of the thigh primarily, it is rare to find a case of inversion of the feet improved by an apparatus which rotates the thigh outward, as this of itself *does not* change the angle of the foot with the leg (which constitutes true inversion or eversion), and even if this condition be present, it is preferable to primarily effect eversion at the ankle, and secondarily effect a rotation of the entire limb at the pelvis, although the latter is rarely necessary, as in by far the great majority of cases of inverted feet, eversion at the ankle is alone required.

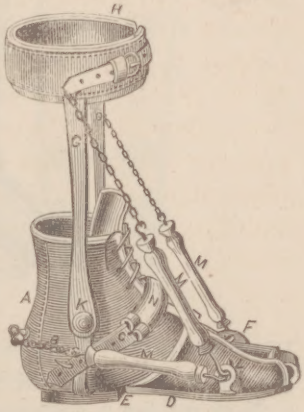

FIG. 2.

To effect eversion, a shoe is sometimes used with the sole divided transversely and the segments connected. In Prof. L. A. Sayre's club-foot shoe these segments are connected by a ball and socket-joint, and in Barwell's (see Fig. 3) the joint is that shown; in both, the eversion being attempted by the adjustment of appropriate rubber cords. The action of this form of apparatus, instead of being at the ankle, is at the medio-tarsal joint, and consists in bending the anterior portion of the foot upon the posterior, and does not evert

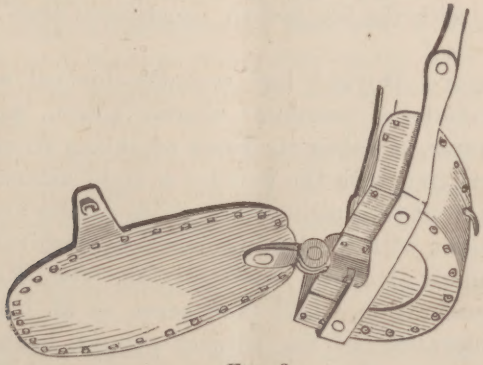

FIG. 3.

the foot as a whole, for by looking again at Figs. 2 and 3 we see that the rigid frame on either side of the heel is the

same as in Fig. 1, and allows only a vertical motion at the ankle.

Another form of apparatus used for producing eversion is Prof. F. H. Hamilton's. This is shown in Fig. 4, and is not

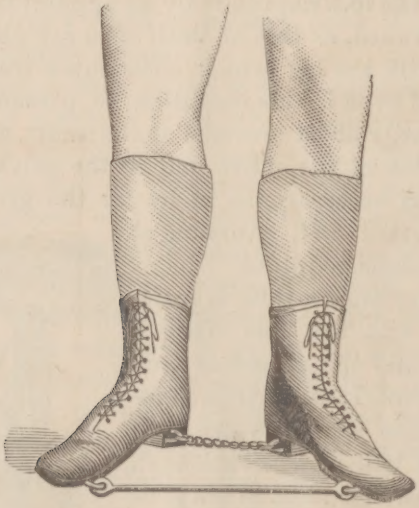

FIG. 4.

practicable except on level surfaces, but is very effective and produces a true eversion.

Now unless a deficiency of muscular power exists in the muscles of the thigh primarily, it is rare to find a case of inversion of the feet improved by an apparatus which rotates the thigh outward, as this of itself *does not* change the angle of the foot with the leg (which constitutes true inversion or eversion).

Dr. Gregory Doyle* has recently devised an apparatus which produces a constant elastic action, and, like the rotating-screw, it takes its basis of action from the pelvis, and is connected with the foot by a rigid attachment. It is an arrangement for pulling the outside of the foot upward at various angles with the leg, by means of a spiral spring, and does not admit of a true local eversion. (See Fig. 6.)

This enumeration, which may serve as an introduction to the consideration of the subject proper, leads us to conclude that none of the contrivances at present in use are

* Transactions American Medical Association for 1880–81.

adapted to the physiological cure of the condition of weak ankles and inverted feet, since they do not simulate the functions of the peronei muscles, whose insufficiency causes the complaint, and do not produce eversion at the ankle-joint. These muscles have their origin above the ankle but below

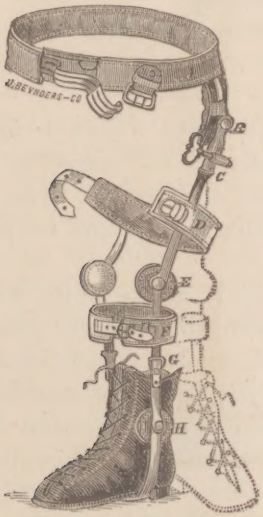

FIG. 5.

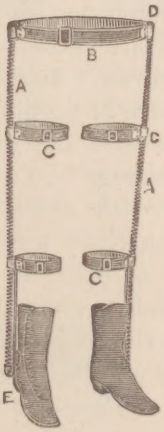

FIG. 6.

the knee, and their insertion below the ankle and mostly anterior to the medio-tarsal joint. Hence, to copy their action we must copy their arrangement and contrive a brace which will allow all normal motion of the foot on the leg, and still by elastic tension remedy the deformity.

I have devised an apparatus for the cure of this condition which is effective, because it is physiological, and it exhibits several principles distinct from any heretofore introduced to the profession:

First.—It consists merely of a steel strip worn outside the leg only, so that there is nothing on the inside to interfere with the child's walking, and is extremely light and comfortable.

Second.—It can be worn with any shoe and is detachable at pleasure.

Third.—It is attached to the bottom of a shoe by a pivot in the centre of motion of the foot* (Fig. 7), thus allowing

* Ibid.

lateral motion in the ankle, a feature not possessed by any other form of apparatus.

Fourth.—The joint at the ankle is placed at the back of the heel, thus affording increased leverage for the action of the elastic cords, and preventing the foot from going "over the centre" when the cords are in action.

Fifth.—The traction produced by the elastic cords corresponds to the lines of direction of the force exerted by the peronei muscles.

There are two essentials to the complete and perfect action of this brace: first, the pivot should be located at or near the centre of motion of the foot; and second, if an everting cord be used, the girth about the leg should be prevented from rotating.

The *centre of motion* (see Fig. 7) is the point where two bisecting lines meet when drawn through the foot while rotated at different angles; and, when a person stands erect, a line drawn vertically through the hip joints should pass at or near this point; and this is the proper position in which to place an attachment between a brace and shoe, instead of against the heel, as in all other forms of apparatus.

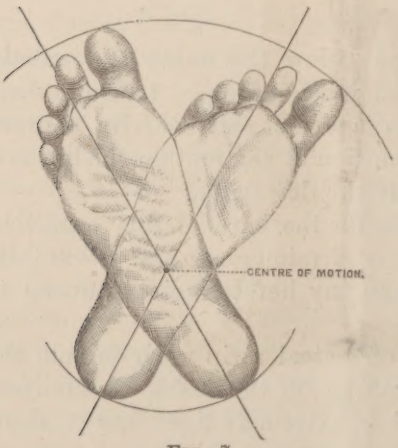

FIG. 7.

Slipping of the leg-girth is prevented by the employment of a strip of moleskin adhesive plaster, as in Fig. 12, so placed as to have a tongue protrude in the median line posteriorly. When the brace is applied this tongue passes into the buckle of the girth, together with the tongue of the girth, effectually preventing the girth from slipping, as the buckle holds two girths, each pulling in a contrary direction; but the slight amount of this pulling does not inconvenience the wearer, owing to the distance between it and the everting cord. In the great majority of cases, however, no adhesive plaster is necessary.

Fig. 8 exhibits the pivotal attachment of the brace to the

shoe when the everting cord is not attached; Fig. 9 shows the change produced by the action of the everting cord when attached.

Fig. 8.

Fig. 9.

Fig. 10 shows the braces as they appear when applied, and their effect on the inversion. This brace is simple, unique, and efficient in all cases of weak ankles and inverted feet, and out of an experience with over fifty cases since the invention of the brace, I have yet to find one not permanently improved. The steel strip supplies rigid support, imitating the bone; the rubber cord and webbing supplies the elastic support, and the joints of the brace are so placed as to permit the utmost freedom of motion. The length, strength, and position of the elastic cords—to effect a cure in the least

Fig. 10.

time—are of course left to the experience and discretion of the surgeon in charge. In weak ankles alone, without inversion, an elastic strap passing from the foot to the brace, as in Fig. 11, is to be employed. If inversion alone be present, the elastic cord is adjusted, as shown in Fig. 16, after the fixation of the girth, as shown in Figs. 14 and 15.

If both conditions be present, both cords must be employed, as in Fig. 12.

The following case I have quoted to show its effect in an

Fig. 11.

Fig. 12.

extreme condition, and for its bearing upon the question of **local eversion versus thigh rotation.**

W. B—, aged fourteen years, Norwalk, Conn., was attacked

Fig. 13.

Fig. 14.

with malignant diphtheria in November, 1876, and upon recovery the muscular system of the left limb was found of diminished size and tone. As time elapsed he became de-

formed—a lateral rotary curvature taking place in the back, and the pelvis becoming tilted by a sacro-lumbar* curvature until the affected limb was raised two inches from the ground, apparently that much shorter than its fellow. He was wearing a raised shoe when he came under observation, and the thigh of the affected side was three and a half inches less than the other, the leg being two inches less. The curvatures of the back were relieved by measures to be described

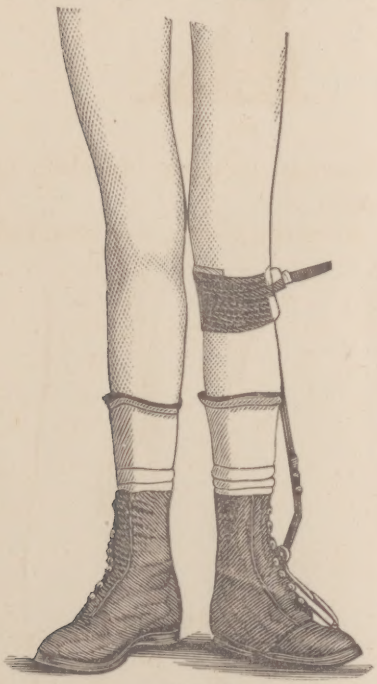

FIG. 15.

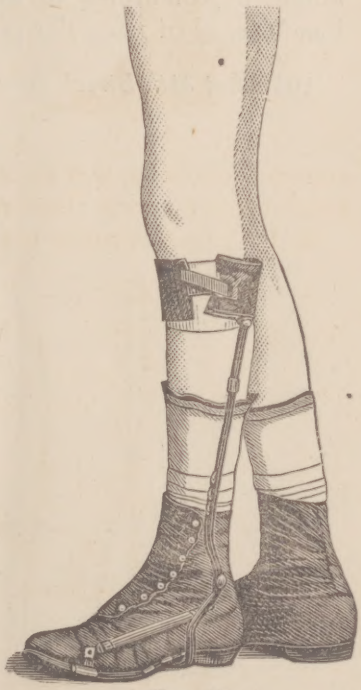

FIG. 16.

in a subsequent article, and the foot brought down to a level with the other (see Fig. 13). The inversion of the foot and the weakness of the ankle were extreme, and occasioned a very limping, lame gait. By the accompanying engravings—which are made from photographs taken July 16, by Klauser—it will be seen that the thigh of the affected side is disproportionately small (see Fig. 15), being two inches less in circumference at that time; so that I doubted the curative

*This name, original with Dr. Stillman, is now introduced for the first time to represent tilting of the pelvis.

result to be obtained by the local evertor without accompanying it with a thigh rotator. But I found that the application of the local brace alone not only did turn the foot outward, but it also caused the entire limb to rotate normally—nature evidently demonstrating that when the foot becomes normally everted at the ankle, the proper degree of rotation of the hip will usually involuntarily follow, provided, of course, that no abnormal conditions of hip or muscles be present beyond insufficiency of muscular power.

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